AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application. Please amend claims 2, 13, and 19 and add claims 21-37 as follows:

1. (Original) A locomotive, comprising:

a plurality of direct current traction motors corresponding to a plurality of axles and a plurality of drive switches; and

a plurality of free-wheeling bypass circuits, each bypass circuit bypassing a corresponding one of the plurality of plurality of drive switches.

2. (Currently Amended) The locomotive of claim [2]1, further comprising:

a plurality of chopper circuits corresponding to the plurality of direct current traction motors, each chopper circuit comprising a respective free-wheeling bypass circuit and drive switch in electrical communication with a respective direct current traction motor.

3. (Original) The locomotive of claim 2, wherein, in a first mode, at least most of the electrical current passing through the chopper circuit passes through the corresponding free-wheeling bypass circuit and the corresponding traction motor and bypasses the corresponding drive switch and, in a second mode, at least most of the electrical current passing through the chopper circuit passes through the corresponding drive switch and traction motor and bypasses the corresponding free-wheeling bypass circuit.

4. (Original) The locomotive of claim 3, wherein, during a selected time interval, a first chopper circuit corresponding to a first traction motor is in the first mode and a second chopper circuit corresponding to a second traction motor is in the second mode.

5. (Original) The locomotive of claim 1, wherein each free-wheeling bypass circuit comprises a free-wheeling gate.

6. (Original) The locomotive of claim 1, further comprising:

a controller operable to (a) determine the power requirement for each motor at each of a number of successive time intervals; (b) determine the necessary voltage and pulse width to achieve the desired power for each motor; and (c) sequentially pulse power to each of the motors for a duration necessary to achieve the power requirement at each successive time interval.

7. (Original) The locomotive of claim 6, wherein, during a selected time interval, a first traction motor receives a first power pulse and a second different traction receives a second power pulse and wherein the first and second power pulses have differing magnitudes.

8. (Original) The locomotive of claim 7, wherein the first and second power pulses are nonoverlapping.

9. (Original) The locomotive of claim 8, wherein, when the first traction motor receives the first power pulse, the second traction motor receives no power pulse and, when the second traction motor receives the second power pulse, the first traction motor receives no power pulse.

10. (Original) A method for operating a locomotive, comprising:

providing a plurality of direct current traction motors corresponding to a plurality of axles and at least one chopper circuit, the at least one chopper circuit comprising a corresponding drive circuit, the drive circuit including a corresponding drive switch and

being in electrical communication with a corresponding one or more of the plurality of traction motors, and a corresponding free-wheeling bypass circuit, the bypass circuit bypassing the corresponding drive switch, wherein, in a first mode, at least most of the electrical current passing through the corresponding chopper circuit passes through the corresponding free-wheeling bypass circuit and corresponding one or more of the plurality of traction motors and bypasses the corresponding drive switch and, in a second mode, at least most of the electrical current passing through the corresponding chopper circuit passes through the corresponding drive switch and the corresponding one or more traction motors and bypasses the corresponding free-wheeling bypass circuit; and

during a selected time interval, operating at least one of the traction motors in the first mode and a different at least one of the traction motors in the second mode.

11. (Original) The method of claim 10, wherein the corresponding at least one chopper circuit includes a plurality of respective chopper circuits corresponding to the plurality of direct current traction motors, each chopper circuit comprising a corresponding free-wheeling bypass circuit and drive switch in electrical communication with a respective direct current traction motor.

12. (Original) The method of claim 10, wherein each free-wheeling bypass circuit comprises a free-wheeling gate.

13. (Currently Amended) The method of claim 10, further comprising:

determining the power requirement for each motor at each of a number of successive time intervals;

determining the necessary ~~effective voltage and~~ pulse width to achieve the desired power for each motor; and

sequentially pulsing each of the motors for a duration necessary to achieve the power requirement at each successive time interval.

14. (Original) The method of claim 13, wherein, during a selected time interval, a first traction motor receives a first power pulse and a second different traction receives a second power pulse and wherein the first and second power pulses have differing magnitudes.

15. (Original) The method of claim 14, wherein the first and second power pulses are nonoverlapping.

16. (Original) The method of claim 15, wherein, when the first traction motor receives the first power pulse, the second traction motor receives no power pulse and, when the second traction motor receives the second power pulse, the first traction motor receives no power pulse.

17. (Original) The method of claim 13, wherein power is cut and then restored to a first motor, while maintaining at least substantially constant power to the remaining motors, to correct loss of traction on the first motor.

18. (Original) The method of claim 13, wherein over-current protection for each individually controlled motor is provided.

19. (Currently Amended) The method of claim 13, wherein power is also provided to all of the plurality of motors constantly at reduced <u>pulse width</u>~~voltage~~ during selected intervals.

20. (Original) The method of claim 13, wherein said power is sequentially pulsed using a pulse width modulation device.

Please add the following new claims 21-37:

21. (New) The locomotive of claim 1, wherein each of the plurality of drive switches is operable to pulse power sequentially to each of the traction motors produce a selected power requirement for each traction motor during a selected time interval, wherein the pulse width is varied depending on a measured characteristic of the respective traction motor.

22. (New) The locomotive of claim 21, wherein, for each motor, the frequency of pulses is maintained at least substantially constant and wherein the measured characteristic is at least one of revolutions per minute and electrical current.

23. (New) The locomotive of claim 21, wherein the pulses to each of the traction motors are time sequenced such that a time separation between adjacent pulses to different traction motors is at least substantially maximized and wherein the measured characteristic is an electrical current supplied to each traction motor.

24. (New) The method of claim 10, wherein the at least one chopper circuit is operable to pulse power sequentially to each of the traction motors produce a selected power requirement for each traction motor during a selected time interval, wherein the pulse width is varied depending on the measured characteristic of the respective traction motor.

25. (New) The method of claim 24, wherein, for each motor, the frequency of pulses is maintained at least substantially constant.

26. (New) The method of claim 25, wherein the pulses to each of the traction motors are time sequenced such that a time separation between adjacent pulses to different traction motors is at least substantially maximized.

27. (New) A method for addressing non-synchronous wheel slippage, comprising:

providing a plurality of traction motors, each of the plurality of traction motors being independently coupled to and driving at least one wheel;

detecting an operating characteristic of each of the plurality of traction motors;

determining that the at least one wheel corresponding to a first traction motor is experiencing wheel slippage; and

in response to the determining step, reducing power supplied to the first traction motor for a selected period of time while continuing to provide power in excess of the reduced power to the remaining traction motors.

28. (New) The method of claim 27, wherein the determining step comprises:

determining that the operating characteristic of the first traction motor has a predetermined relationship with an operating characteristic setpoint.

29. (New) The method of claim 28, wherein the operating characteristic is at least one of a corresponding operating speed of each of the plurality of traction motors and a corresponding electrical current supplied to each of the plurality of traction motors and further comprising:

comparing a detected operating characteristic detected for each of the traction motors to the operating characteristic setpoint and wherein, when the detected operating speed has the predetermined relationship with the operating characteristic setpoint, the at least one wheel of the corresponding traction motor is determined to be experiencing wheel slippage.

30. (New) The method of claim 28, wherein the reducing step is performed until the detected operating characteristic for the first traction motor no longer has the predetermined relationship with the operating characteristic setpoint.

31. (New) A controller operable to perform the steps of claim 27.

32. (New) A system for addressing non-synchronous wheel slippage, comprising:

a plurality of traction motors, each of the plurality of traction motors being independently coupled to and driving at least one wheel;

a plurality of sensors operable to sense an operating characteristic of each of the plurality of traction motors, wherein each of the sensors corresponds to a traction motor; and

a controller operable to determine that the at least one wheel corresponding to a first traction motor is experiencing wheel slippage and, in response thereto, reduce a level of power supplied to the first traction motor for a selected period of time while continuing to provide levels of power in excess of the reduced power to the remaining traction motors.

33. (New) The system of claim 32, wherein the controller is further operable to determine that the operating characteristic of the first traction motor has a predetermined relationship with a speed set point.

34. (New) The system of claim 33, wherein the controller is further operable to compare a detected operating characteristic detected for each of the traction motors to the operating characteristic set point and, when the detected operating characteristic exceeds the operating characteristic set point, determine that the at least one wheel of the corresponding traction motor is experiencing wheel slippage.

35. (New) The system of claim 32, wherein the controller is operable to reduce the level of power supplied to the first traction motor until the at least one wheel of the first traction motor is no longer experiencing slippage.

36. (New) The system of claim 32, wherein the controller is operable to increase the level of power supplied to the first traction motor when the at least one wheel of the first traction motor has a detected operating speed in excess of the speed set point.

37. (New) The system of claim 32, wherein the operating characteristic is a corresponding electrical current supplied to each of the traction motors.